

What is claimed is:

1           1.     A table image processing device comprising:  
2                 means for extracting a line extracting the longitudinal line and lateral line  
3                 from an input image;  
4                 means for finding a potential match of a round corner region extracting  
5                 an oblique line which commences from a terminal of a line found by the line  
6                 extracting means, and finding a potential match of the round corner region based  
7                 on the oblique line;  
8                 means for extracting a cell finding cells containing the potential match of  
9                 the round corner found by the potential match of the round corner region finding  
10                means; and  
11                means for deciding a round corner part deciding a round corner based on  
                the cells found by the cell extracting means.

2           2.     The table image processing device in claim 1, wherein the means  
                for finding the potential match of the round corner region extracts the oblique  
                element by extracting a first oblique element starting a terminal of a longitudinal  
                line, and a second oblique element commencing from a terminal of a lateral line  
                within the lines found by the line extracting means.

3           3.     The table image processing device in claim 2, wherein the means  
4                 finding a potential match of a round corner region decides, in case that the first  
5                 oblique element and the second oblique element overlap, the part as the potential  
6                 match of the round corner

1           4.     The table image processing device in claim 2, wherein the means  
2                 for finding a potential match of a round corner region decides the part as the  
3                 potential match of the round corner region in case that the first oblique element  
4                 and the second oblique element are within a distance fixed in advance and there

1 is a pattern showing a line feature between them, or contact or overlap each  
other.

1 5. The table image processing device in claim 2, wherein the means  
2 for finding potential match of the round corner region decides the part as the  
3 potential match of the round corner region in case that any another oblique  
4 element does not exist near an identified oblique element and there is a pattern  
showing a line feature at the terminal of the identified oblique line.

1 6. The table image processing device in claim 1, wherein the means  
2 for round corner part decides the part as the round corner in case that the pixel  
3 density at a corner of a cell extracted by the means for extracting the cell  
changes in a fixed order.

7. The table image processing device in claim 1, wherein the means  
for deciding a round corner part decides the part as the round corner, in case  
that a round corner part decided based on the pixel density change exists,  
another corner of the input image is decided as a round corner.

8. The table image processing device in claim 1, wherein the means  
for deciding a round corner decides, in case that a pattern of nth order function  
generated between the terminals of lines extracted by the means for extracting  
line matches a part of the input image, the part as the round corner.

1 9. The table image processing device in claim 1 comprises further:  
2 means for inputting an image containing a sheet image containing ruled  
3 lines; and

4 means for finding regions recognizing character finding the character  
5 recognition region by neglecting the round corner part decided by the means for  
deciding round corner in the cells containing the round corner.

1           10.    A table image processing device including a potential match of a  
2 round corner finding device, wherein the potential match of the round corner  
3 finding device comprises:

4           extracting a first oblique element commencing from a terminal of  
5 longitudinal line, and a second oblique element commencing from a terminal of  
6 lateral line each from the lines extracted within the input image, and, in case  
7 that the first oblique element and the second oblique element overlap, the part  
being decided as the potential match of the round corner region.

1           11.    A table image processing device including a potential match of a  
2 round corner finding device, wherein the potential match of the round corner  
3 finding device extracts:

4           a first oblique element commencing from a terminal of a longitudinal  
5 line, and a second oblique element commencing from a terminal of a lateral line  
6 each from the lines extracted from the input image, and, in case that the first  
7 oblique element and the second oblique element are within a distance fixed in  
8 advance and a pattern showing a line feature exists, or contact or overlap each  
9 other, and determines the part as the potential match of the round corner region.

1           12.    A table image processing device including a potential match of a  
2 round corner finding device, wherein the potential match of the round corner  
3 finding device comprises:

4           means for extracting a first oblique element commencing from a terminal  
5 of a longitudinal line, and a second oblique element commencing from a  
6 terminal of a lateral line within the lines extracted from the input image, and, in  
7 case that any oblique element does not exist near an identified oblique element  
8 and a patter showing a line feature exists at the terminal of the identified oblique  
9 line, the part being decided as the potential match of the round the corner  
region.

1  
2  
3  
4  
5  
  
1  
2  
3  
4  
5  
  
1  
2  
3  
4  
5  
6  
7  
8

13. The table image processing device providing a round corner deciding device, wherein the round corner deciding device comprises:  
a unit deciding, concerning to a cell extracted from longitudinal lines and lateral lines extracted from an input image, in a case that the pixel density changes in an order fixed in advance at a corner of the cell, the part as the round corner.

14. The table image processing device providing a round corner deciding device, wherein the round corner deciding device comprises:  
a means deciding, concerning to a cell extracted from longitudinal lines and lateral lines extracted from an input image, in a case that the a round corner decided based on the pixel density change exists, another corner part being decided as the round corner.

15. The table image processing device providing a round corner deciding device, wherein the round corner deciding device comprises:  
means for deciding, concerning to a cell extracted from longitudinal lines and lateral lines extracted from an input image, in a case that a pattern of nth order function generated between the lines in the cell matches the input image at a corner containing a potential match of a round corner region, the part as a round corner.

16. A memory medium storing a program for implementing in a computer a table image processing device, wherein the program comprises:  
extracting lines of longitudinal line and lateral line within an input image;  
finding a potential match of a round corner region by extracting an oblique line which commences at a terminal of a line extracted by the process for extracting lines, and finding a potential match of a round corner region by fixed process using the extracted oblique line;

1 finding cells containing the potential match of the round corner region  
2 found by the process for finding the potential match of round corner region;  
3 deciding a round corner part by fixed process for the corner of cells  
extracted by processing for extracting cell.

AD  
CDN's  
1 17. A table image processing device including means for processing  
2 finding a ruled line, wherein the means for processing finding the ruled line  
3 comprises:

4 means, within potential matches of the ruled line of a longitudinal line  
5 and lateral line extracted from an input image, for finding whether the identified  
6 potential match of the ruled line is a ruled line or not based on roughness of the  
7 potential match of the ruled line and any one of threshold of different plural  
8 thresholds corresponding to an image pattern extracted from the input image  
9 pattern existing around the identified potential match of the ruled line.

10 18. The table image processing device in claim 17, wherein the  
11 means for processing finding a ruled line comprises:

1 a pixel density finding process part finding whether the identified  
2 potential match of the ruled line is ruled line or not based on the roughness of  
3 the potential match of the ruled line by using a first threshold fixed in advance  
4 and a second threshold fixed in advance higher than the first threshold,

5 wherein the pixel density finding process part, corresponding to the pixel  
6 density of the image pattern existing around the identified potential match of the  
7 ruled line, uses the first threshold in a case that the image pattern other than the  
8 identified potential match of ruled line is high, and uses the second threshold in  
9 case that the image pattern other than the identified potential match of ruled line  
10 is low.

1 19. The table image processing device in claim 18 ,wherein the ruled

1 line finding means,

2 when the potential match of the ruled line is a longitudinal line, an image  
3 pattern of same length as the potential match of the ruled line existing right and  
4 side of the potential match of the ruled line within a fixed range is used as the  
5 image pattern existing around the potential match of the ruled line,

6 when the potential match of the ruled line is a lateral line, an image  
7 pattern of same length as the potential match of the ruled line existing up and  
8 under of the potential match of the ruled line within in a fixed range is used as  
the image pattern existing around the identified potential match of the ruled line.

AD  
CON-1  
1 20. The table image processing device in claim 17, wherein the ruled  
2 line finding means comprises:

3 the ruled line width finding process means finding whether the potential  
4 match of the ruled line is ruled line or not base on the roughness found by the  
5 first threshold fixed in advance or the second threshold fixed in advance higher  
6 than the first threshold;

7 the ruled line width finding process means, corresponding to the width  
8 of the image pattern existing around the identified potential match of the ruled  
9 line, uses the first threshold in a case that the width of the image pattern is  
10 wide, and uses the second threshold in a case that the width of the image pattern  
is narrow.

1 21. The table image processing device in claim 20, wherein the ruled  
2 line width finding process means uses the potential match of the ruled line  
3 extending to same direction as the identified potential match of ruled line and  
4 adjacent or connected to the identified potential match of ruled line as the image  
pattern existing around the identified potential match of ruled line

1 22. The table image processing device in claim 20, wherein the ruled

1 line width finding process means decides the width of the potential match of the  
2 ruled line to be wide in a case that the width of potential match of ruled line is  
3 grater than the n times of the width of the image pattern existing around the  
4 identified potential match of ruled line, and to be narrow in a case that the width  
5 of potential match of ruled line is less than the 1/n times of the width of the  
6 image pattern existing around the identified potential match of ruled line

1 23. The table image processing device in claim 17 further  
2 comprising:

3 means for extracting a line extracting longitudinal lines and lateral lines  
4 from an input image;

5 means for extracting cells by using the longitudinal line and the lateral  
6 line;

7 means for deciding region recognizing character deciding region  
8 recognizing character; wherein

9 the means for extracting a line includes the means for finding the  
10 potential match of the ruled line,

11 the means for finding ruled line using the longitudinal lines and the  
12 lateral lines extracted from the means for extracting lines as the potential match  
13 of the ruled line and deciding whether the potential match of the ruled line is a  
14 ruled line or not,

15 the means for extracting the cells extracting the cells based on the result  
decided by the means for deciding ruled line.

1 24. The table image processing device in claim 17 comprising:

2 means for extracting a line extracting longitudinal lines and lateral lines  
3 from an input image;

4 means for finding the potential match of round corners extracting an  
5 oblique element at a terminal of a line extracting by the means for extracting

1 lines and finding a potential match of a round corner by using an oblique  
2 element the extracted oblique element; and  
3 means for extracting cells containing the potential match of the round  
4 corner by using the means for finding potential match of the round corners;  
5 means for deciding round corners by processing deciding a round corner  
6 for corner of cells extracted by the means for extracting cells; and  
7 means for deciding region recognizing character deciding region  
8 recognizing character finding the character recognition region by neglecting the  
9 round corner part decided by the means for deciding the round corner in the  
10 cells containing round corner; wherein  
11 the means for extracting a line containing the means for finding the  
12 potential match of the ruled line;  
13 the means for finding the ruled line using the longitudinal lines and the  
14 lateral lines extracted from the means for extracting lines as the potential match  
15 of the ruled lines and deciding whether the identified potential match of the  
16 ruled line is a ruled line or not; and  
17 the means for finding potential match of the round corner region  
18 extracting the oblique element by using a line founded by the means for finding  
19 ruled lines;  
20 the means for extracting the cells extracting the cells based on the result  
founded by the means for finding ruled lines.

1 25. A memory medium storing program for implementing in a  
2 computer of a table image processing device, wherein the program comprises:  
3 within the potential match of the ruled line of longitudinal line and lateral  
4 line extracted from an input image, finding whether the identified potential  
5 match of ruled line is a ruled line or not based on roughness of the identified  
6 potential match of the ruled line by using any one of threshold of different plural  
7 thresholds corresponding to an image pattern extracted from the input image



pattern existing around the identified potential match of the ruled line.

1           26.    A table image processing method comprising:  
2                extracting a longitudinal line and lateral line out of an input image;  
3                extracting an oblique line which commences from a terminal of a line  
4                found by the line extracting process, and finding a potential match of a round  
5                corner region based on the oblique line;  
6                extracting a cell containing the potential match of the round corner  
7                region; and  
              finding the round corner of the cell.

1           27.    A table image processing method for finding a ruled line  
2                comprising:  
3                within potential matches of a ruled line of a longitudinal line and a lateral  
4                line extracted from an input image, finding whether an identified potential match  
5                of the ruled line is a ruled line or not based on a roughness of the potential  
6                match of the ruled line and one of a threshold of different plural thresholds  
7                corresponding to an image pattern extracted from the input image pattern and  
8                existing around the identified potential match of the ruled line.

1           28.    A table image processing device comprising:  
2                a unit extracting a line extracting the longitudinal line and lateral line  
3                from an input image;  
4                a unit finding a potential match of a round corner region extracting an  
5                oblique line which commences from a terminal of a line found by the line  
6                extracting unit, and finding a potential match of the round corner region based  
7                on the oblique line;  
8                a unit extracting a cell finding cells containing the potential match of the  
9                round corner found by the potential match of the round corner region finding

10

unit; and

11

a unit deciding a round corner part deciding a round corner based on the cells found by the cell extracting unit.

1

29. The table image processing device in claim 28, wherein the unit finding the potential match of the round corner region extracts the oblique element by extracting a first oblique element starting a terminal of a longitudinal line, and a second oblique element commencing from a terminal of a lateral line within the lines found by the line extracting unit.

2

3

4

sub  
AU

1

30. The table image processing device in claim 29, wherein the unit finding a potential match of a round corner region decides, in case that the first oblique element and the second oblique element overlap, the part as the potential match of the round corner.

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

31. The table image processing device in claim 29, wherein the unit for finding a potential match of a round corner region decides the part as the potential match of the round corner region in case that the first oblique element and the second oblique element are within a distance fixed in advance and there is a pattern showing a line feature between them, or contact or overlap each other.

1

2

3

4

32. The table image processing device in claim 29, wherein the unit for finding potential match of the round corner region decides the part as the potential match of the round corner region in case that any another oblique element does not exist near an identified oblique element and there is a pattern showing a line feature at the terminal of the identified oblique line.

1

33. The table image processing device in claim 28, wherein the unit

1 for round corner part decides the part as the round corner in case that the pixel  
2 density at a corner of a cell extracted by the unit extracting the cell changes in a  
fixed order.

1 34. The table image processing device in claim 28, wherein the unit  
2 for deciding a round corner part decides the part as the round corner, in case  
3 that a round corner part decided based on the pixel density change exists,  
another corner of the input image is decided as a round corner.

1 35. The table image processing device in claim 28, wherein the unit  
2 deciding a round corner decides, in case that a pattern of nth order function  
3 generated between the terminals of lines extracted by the unit for extracting line  
matches a part of the input image, the part as the round corner.

1 36. The table image processing device in claim 28 comprises further:  
2 a unit inputting an image containing a sheet image containing ruled lines;  
3 and

4 a unit finding regions recognizing character finding the character  
5 recognition region by neglecting the round corner part decided by the unit  
deciding round corner in the cells containing the round corner.